EXPLORING EARTH'S MYSTERIES
...PROTECTING ITS FUTURE

Service Station Facility

Facility Environmental Monitoring Report

Calendar Year 2004

BROOKHAVEN
NATIONAL LABORATORY

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Prepared by
D. Paquette and J. Williams
Environmental and Waste Management Services Division

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Summary of Results

Carbon tetrachloride and its breakdown products continue to be detected in groundwater surveillance wells used to monitor the service station facility. The carbon tetrachloride was released from a former underground storage tank that was located approximately 200 feet northwest (upgradient) of the station. As the result of active groundwater remediation, carbon tetrachloride concentrations in the service station wells have decreased from approximately 4,500 μg/L in 2000 to a maximum of 180 μg/L in 2004.

Volatile organic compounds associated with petroleum products (e.g., ethylbenzene, xylene, trimethylbenzenes and MTBE) and the solvent tetrachloroethylene continue to be detected in groundwater at concentrations exceeding groundwater quality standards. During 2004, the highest contaminant concentrations were observed in well 085-236 located downgradient of the service station building. In this well, xylenes (total) were detected up to 146 μg/L, trimethylbenzene (total) was 40 μg/L, and ethylbenzene was 24 μg/L. Methyl-tertiary-butyl ether levels decreased from a high of 144 μg/L during 2003, to less than 4 μg/L by the end of 2004. The solvent tetrachloroethylene was detected at a maximum concentration of 20 μg/L. The water quality standard for these compounds is 5 μg/L, except for MTBE, which is 10 μg/L.

The facility's underground storage tanks and associated distribution lines are not leaking and all waste oils and used solvents are being properly stored and recycled. Therefore, it is believed that the contaminants detected in groundwater originate from historical vehicle maintenance activities, and are not related to current operations.

Background

Building 630 is a commercial automobile service station that is privately operated under a contract with BNL. Potential environmental concerns at the service station include the historical use of underground storage tanks (USTs) to store gasoline and waste oil; hydraulic fluids used for lift stations; and the use of solvents for parts cleaning. In August 1989, the gasoline and waste oil USTs, pump islands, and associated piping were upgraded to conform to Suffolk County Article 12 requirements for secondary containment, leak detection devices, and overfill alarms. During the removal of the old USTs, no obvious signs of soil contamination were observed. The present tank inventory includes three 8,000-gallon USTs used to store unleaded gasoline, one 500-gallon UST for waste oil, and one 1,000-gallon UST for fuel oil. The facility also has three vehicle lift stations.

Groundwater quality in the service station area has been impacted by historical small-scale spills of oils, gasoline, and solvents as a result of station operations, and carbon

tetrachloride releases from a UST located approximately 200 feet northwest (upgradient) of the station. The UST, which had been used as part of a Chemistry Department experiment conducted in the 1950s, was removed in April 1998. Although there are indications that the tank was releasing small quantities of carbon tetrachloride prior to the tank removal, a significant increase in carbon tetrachloride concentrations in groundwater indicated that additional amounts of this chemical were inadvertently released during the excavation and removal process. BNL started to remediate the carbon tetrachloride plume in October 1999.

Evaluation of Service Station Operations

During 2004, there were no reported gasoline or motor oil losses or spills, and all waste oils and used solvents generated from current operations were properly stored and recycled. The gasoline storage tanks have electronic leak detection systems, and there is a daily product reconciliation (i.e., an accounting of the volume of gasoline stored in underground storage tanks and volume of gasoline sold).

During 2004, the gasoline suppliers provided all required documentation to show that the gasoline received conformed with federal gasoline reformulation and detergent additive requirements and state VOC requirements.

Environmental Monitoring Program

In 1996, BNL established a groundwater monitoring program at the service station to evaluate potential impacts to environmental quality. The environmental monitoring program for the service station is described in the *BNL Environmental Monitoring Plan* (BNL, 2004).

Monitoring Results

Groundwater

The service station's groundwater monitoring program is designed to confirm that the current engineered and institutional controls are effective in preventing additional contamination of the aquifer. Five wells are used to monitor for potential contaminant releases (Figure 1).

During 2004, carbon tetrachloride (and its breakdown product chloroform) continued to be observed in the service station monitoring wells (Figure 2). The maximum carbon tetrachloride concentration was 180 μg/L, observed in the November 2004 sample from well 085-236. The New York State Ambient Water Quality Standard (NYSAWQS) for carbon tetrachloride is 5 μg/L. Carbon tetrachloride concentrations decreased during the year, with concentrations dropping to less than 120 μg/L by September (Figure 2). These levels are considerably less than those observed during 2000, when carbon tetrachloride

concentrations in wells near the service station approached 4,500 μg/L. The reduction in carbon tetrachloride concentrations reflects the effectiveness of the groundwater restoration system installed to treat this contamination. This system achieved its cleanup objectives and was shutdown in August 2004 (see Volume 2 of the 2004 *BNL Site Environmental Report* for details on the carbon tetrachloride plume and remediation system).

In addition to the carbon tetrachloride contamination from the former UST area, groundwater quality has been affected by a variety of VOCs that appear to be related to historical service station operations. During 2004, petroleum-related compounds such as xylene and ethylbenzene continued to be detected in the groundwater (see Figures 3, 4 and 5). The highest VOC concentrations were detected in well 085-236 in November 2004, with m/p xylene at 67 μg/L, o-xylene at 79 μg/L, 1,2,4-trimethylbenzene at 16 μg/L, 1,3,5-trimethylbenzene at 24 μg/L, and the solvent tetrachloroethylene at a concentration of 20 μg/L (Figure 4).

Low levels of the gasoline additive methyl tertiary butyl ether (MTBE) continued to be detected in all service station area wells, but at concentrations significantly lower than in 2003 when MTBE levels reached a maximum concentration of 144 μg/L. During 2004, the highest MTBE level was detected in well 085-237, at a concentration of 14 μg/L (Figure 5). The NYS AWQS for MTBE is 10 μg/L.

Three of the service station wells were tested for semi-volatile organic compounds (SVOCs). As in previous years, no SVOCs were detected.

Monitoring wells 085-17, 085-236, and 085-237 are downgradient of the southern end of the service station building, and it is likely that the PCE and petroleum-related chemicals detected in groundwater are due to historical discharges to the abandoned service bay floor drains (see BNL, 2003). MTBE was used as a gasoline additive from 1977 until early 2003, and it is likely that the MTBE detected in the service station wells is related to historical vehicle maintenance operations and/or small-scale spillage of gasoline during vehicle refueling.

Future Monitoring Actions

During 2005 the following monitoring activities will take place:

- The service station facility wells will be sampled semiannually for VOCs and tested for the presence of floating product.

- Staff Services Division will continue to review reconciliation records on a frequent basis.

References

BNL, 2003. CY 2002 Facility Environmental Monitoring Report for the Service Station (July 7, 2003).

BNL, 2004. *Brookhaven National Laboratory Environmental Monitoring Plan - Annual Update* (January 2004). BNL-52676.

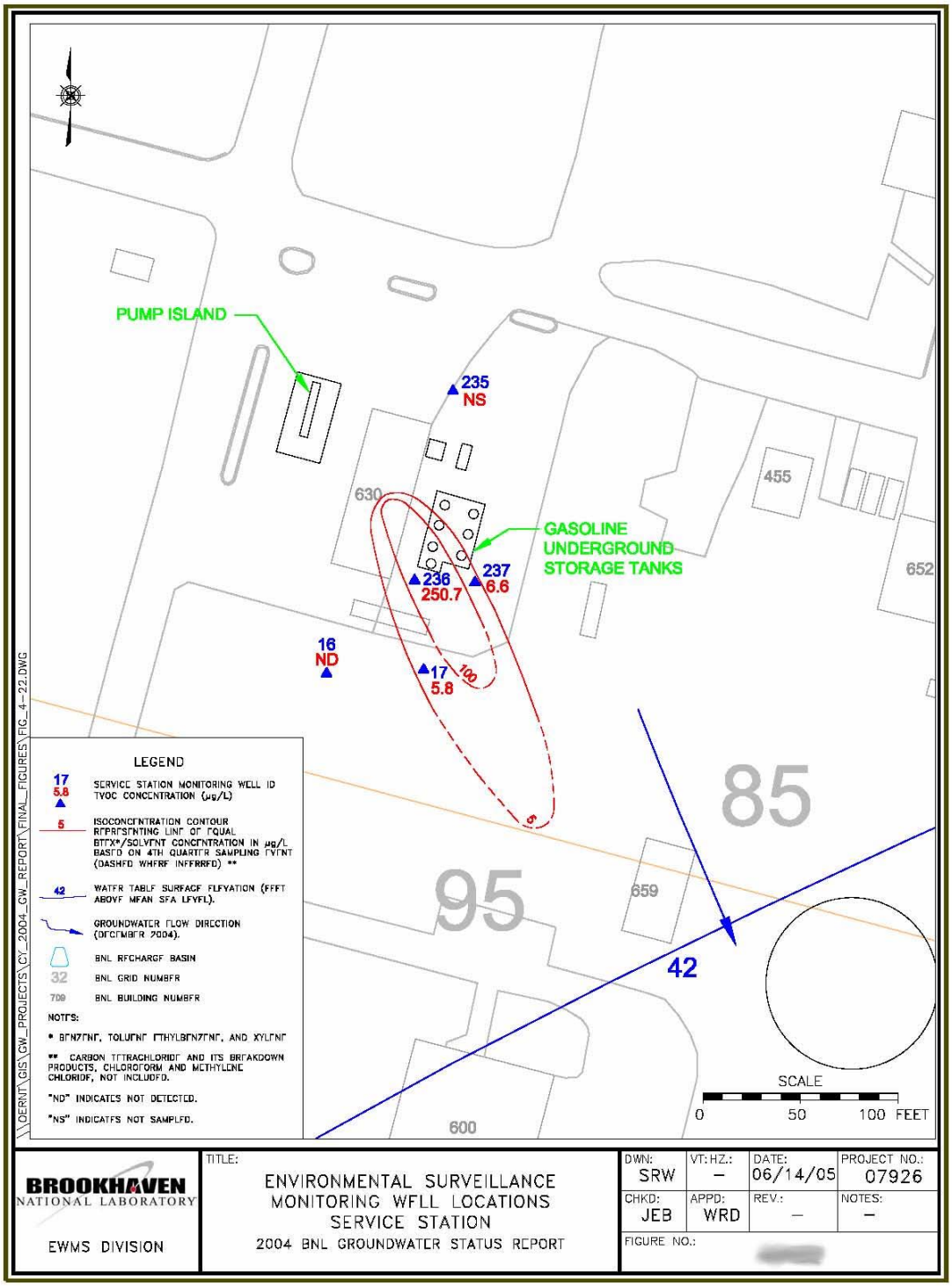

Figure 1. Locations of groundwater monitoring wells at the Service Station.

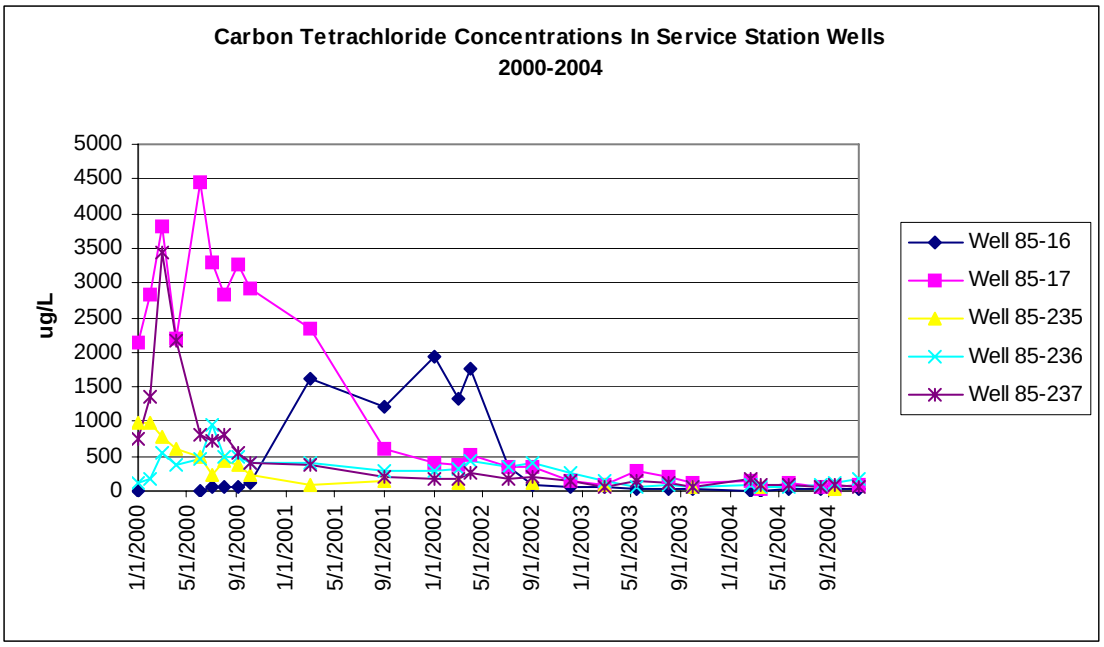

Figure 2: Trend of carbon tetrachloride concentrations in Service Station groundwater monitoring wells. Note that the carbon tetrachloride originated from the former CCl_4 UST that was located upgradient of the Service Station.

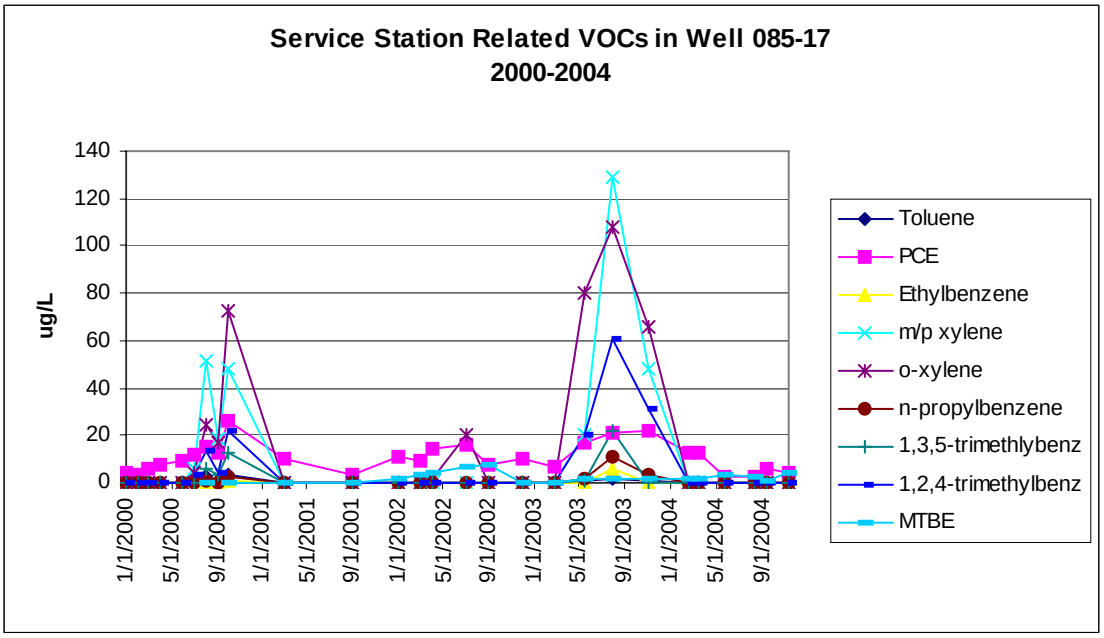

Figure 3. Trend of Service Station-Related VOCs in Downgradient Well 085-17. Note that carbon tetrachloride originating from the upgradient CCl_4 UST source area is not included.

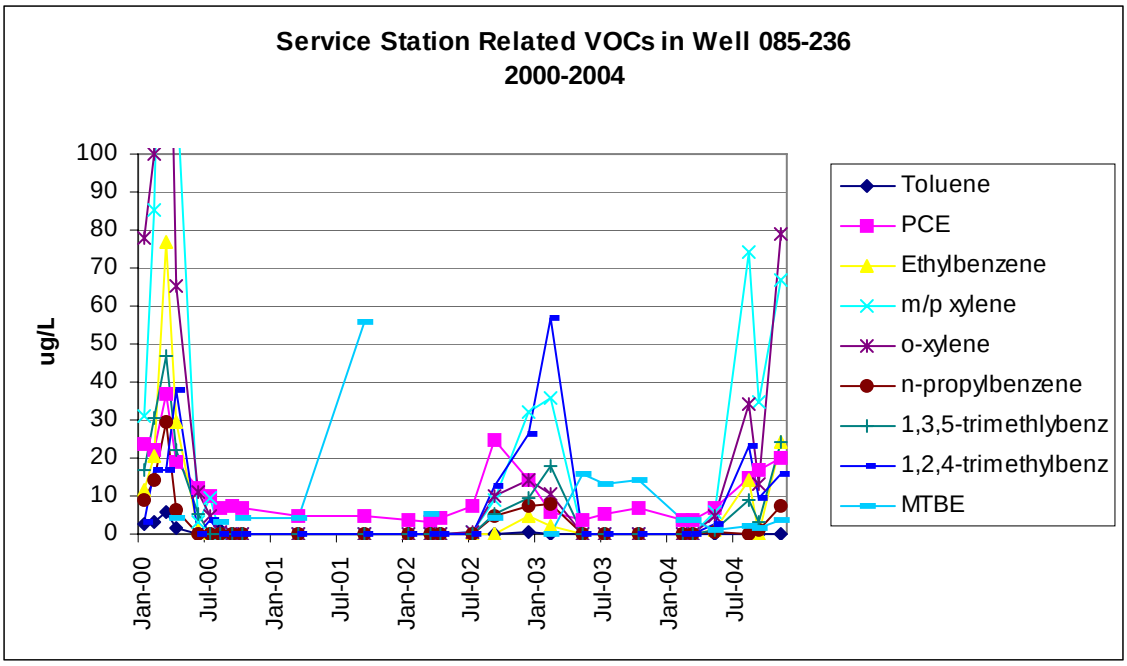

Figure 4. Trend of Service Station-Related VOCs in Downgradient Well 085-236. Note that carbon tetrachloride originating from the upgradient CCl_4 UST source area is not included.

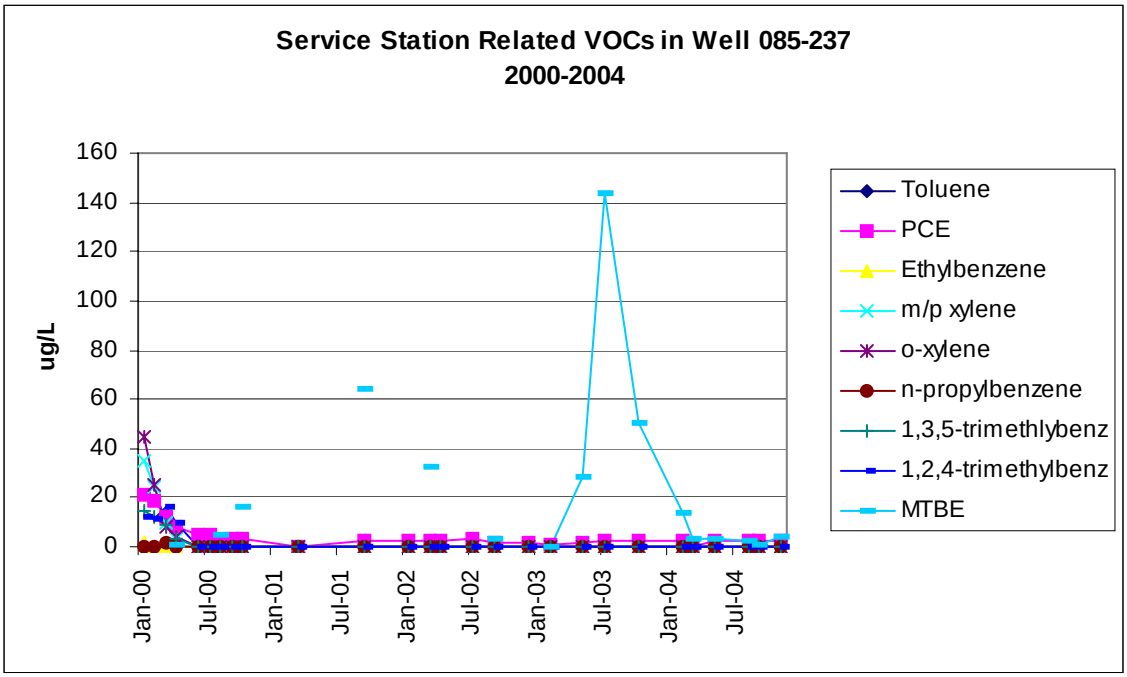

Figure 5. Trend of Service Station-Related VOCs in Downgradient Well 085-237. Note that carbon tetrachloride originating from the upgradient CCl_4 UST source area is not included.